TANGANYIKA

DEPARTMENT OF AGRICULTURE

Fourteenth Annual Report of the Coffee Research and Experimental Station, Lyamungu, Moshi 1947

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A difference between any two treatments greater than the figure given as "Significant difference" is due to the particular treatment. The proof is not absolute but unless otherwise stated the figure for significant difference is at the level of probability $P = 0{\cdot}05$, which means that the chances against drawing a wrong conclusion by using the significant difference figure is nineteen to one. If the significant difference is based on $P = 0{\cdot}01$ then the chances are ninety-nine to one against the conclusion being wrong.

Where no figure significant difference is given the differences that occur cannot be considered as being due to the particular treatment.

I wish to record my thanks to the Statistical Department, Rothamsted Experimental Station for carrying out the analysis of some of the experiments and also to Mr. C. R. Devonshire, Liquorer to the Kenya Coffee Board, for reporting on the many samples sent to him.

I wish also to express my appreciation of the work done by the Staff, particularly during the crop season.

Lyamungu,
December, 1948

F. R. Sanders,
Senior Research Officer

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COFFEE RESEARCH AND EXPERIMENTAL STATION, LYAMUNGU, MOSHI

Report for the Period 1st January to 31st December, 1947

ADMINISTRATION—STAFF

F. R. Sanders, B.A.(Hons.) (Cantab.), Dip.Agric. (Cam.Univ.), Senior Research Officer, in general charge.

J. K. Robertson, B.Sc.(Agric.) (Aberd.), A.I.C.T.A., Agricultural Officer : From 1st January, 1947 to 25th February, 1947.

Major G. N. B. Pletts, Field Officer : From 1st January, 1947 to 19th October, 1947.

V. I. Luxenburg, Agricultural Assistant : From 1st January, 1947 to 31st December, 1947.

L. M. Fernie, Superintendent of Plantations : From 5th November, 1947 to 31st December, 1947.

A. M. Pienaar, Agricultural Assistant : From 1st January, 1947 to 30th August, 1947.

FINANCE

Details of expenditure for the year 1947 are given in Appendix I. Revenue for the period amounted to £1,156 4s. 0d. ; the value of the coffee produced in 1947 will be not less than £5,000, this sum will be received in 1948.

VISITORS

The number of visitors to the station increased considerably.

The Tanganyika Coffee Growers' Association organized a Planters' Day in March. Members of the Kilimanjaro Native Co-operative Union and several parties from the various schools in the district have visited the station.

Members of the Department of Agriculture of Kenya and the Belgian Congo and planters from these territories have also visited the Station.

STATION DEVELOPMENT

A further acre of clonal material of coffee selections was planted.

Statement of Acreages

		Acres	Change
Coffee :—			
(a) under 4 years	7·12		
(b) 4 to 6 years	10·99	86·16	+1·00
(c) over 6 years	68·05		
Nurseries and propagation beds		2·50	
Bananas and fodder grasses		48·00	
Paddocks		30·00	
Coppices and wind belts		35·00	
In preparation for experiments		8·00	−5·60
Forest		23·40	
Roads, buildings, etc.		28·00	
Bush-cleared and uncleared		43·04	+4·60
Food crops for labourers		5·90	
Total		310·00	

BUILDINGS

With funds voted by the Territorial Coffee Board an additional Store and Farm offices were erected.

METEOROLOGY

The rainfall of April and May, 1947, was very heavy, 54·18 inches falling in these two months. January and February were dry but there had been very effective rainfall in the last 4 months of 1946. There was little effective rain during the last 4 months of 1947, there being only two falls of more than half an inch.

The monthly rainfall for 1947 is given below :—

	Inches
January	2·01
February	0·72
March	3·37
April	28·45
May	25·73
June	10·97
July	1·43
August	1·38
September	1·23
October	1·27
November	0·93
December	1·31
Total ...	78·80

The monthly rainfall for the period September, 1937, to August, 1947, is given in Appendix II.

VEGETATIVE PROPAGATION

The problem of raising large numbers of rooted cuttings has still not been solved, the chief losses occur during the hardening off process.

PESTS AND DISEASES

Experiments using D.D.T. oil emulsion for controlling Antestia gave very satisfactory results. It was found that a 0·1 per cent solution applied at the rate of 80 gallons per acre effectively controlled the incidence of Antestia. The results of these experiments were published separately.

Routine sprayings with Bordeaux Mixture to control Hemileia were done on all coffee.

LABOUR

Except in January and February the labour situation was fairly satisfactory. In the main the labour supply proved sufficient for picking the very large crop, the most difficult time was from mid-December onwards when labour became very short because of the Christmas holidays, the coffee ripening at this time had to be picked early in January, 1948, as buni.

STATION EXPERIMENTS

In all experiments a statistical layout is employed. From experiment to experiment, but not within any one experiment, the number of trees in the constituent plots varies. Where seedling material is used there are 25 trees per plot and where clonal material is used the number of trees per plot is reduced to 16 or 12.

In all experiments the individual plot yields have been recorded and calculated in terms of hundredweights of clean coffee per acre and appear as such in all the tables. Similarly where yields of individual parent trees are given for reference (as in Experiment II—Seedling Selection Trials and Experiments IV and XVIII—Clonal Selection Trials) the yields have been calculated in terms of hundredweights of clean coffee per acre.

The detailed results of experiments are given below :—

EXPERIMENT I.—*To test the effect on subsequent growth and yield of seven different methods of planting. No shade. Single Stem. Planted 1935.*

Treatments :—

1. No holing at all. Seedlings to be put in with least disturbance of ground.
2. Hole prepared the size of a "debe"—opened up at least three months before use and filled in with surface soil one month before planting.
3. Hole opened the size of a "debe" and filled in again at once—one month before planting.
4. As per method 2 but bottom of hole sub-soiled one foot deep before filling in.
5. As per method 3 but hole sub-soiled before filling in.
6. As per method 4 but compost mixed with soil at time of filling—½ debe to one hole.
7. As per method 5 but with compost as at 6.
   In each plot, of 4 × 5 trees, one in each of four to be—
   (a) deep planted—ball planting.
   (b) deep planted—bare roots.
   (c) nursery level—ball planting.
   (d) nursery level—bare roots.

No shade trees have been planted in this experiment. The results show that over a period of 10 years coffee planted at the correct level either with a ball of earth or with bare roots has yielded better than deeply planted coffee in each individual year and over the 10 years period has given an additional yield of one hundredweight of clean coffee per acre per annum. The results have varied in significance in individual years but the cumulative results are significant.

The other treatments, time of holing out and placing of compost in the holes, have not given conclusive results but the results indicate that holing out 3 months before the time of planting, and filling in the hole one month before planting, is sound practice. Filling in one month before planting allows the soil in the hole to settle and obviates the possibility of further sinking of the soil after planting has been done, if the soil in the hole sinks after planting the plant will sink also and it will amount to a degree of deep planting.

SUMMARY OF RESULTS 1938-1947

Yields in cwt., clean, per acre.

	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	Summary of Results 1938-1947	Percentages
(a) MAIN PLOTS	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	
Treatments :												
No holing	6·66	2·11	5·08	11·94	5·04	17·11		24·86		22·20	9·81	101·1
*H3F1	7·90	1·13	6·85	11·67	4·98	17·42		27·73		25·77	10·54	108·7
†HF1	5·65	1·43	5·35	10·76	3·89	11·87		27·55		22·84	9·30	95·9
Hole sub-soiled :												
Without compost H3F1	7·78	1·17	6·51	12·30	3·81	14·77		26·14		24·21	10·02	103·3
Without compost HF1	6·11	1·53	5·46	11·43	3·70	13·24		25·19		23·71	9·34	96·3
With compost H3F1...	8·29	0·82	5·83	11·72	4·85	14·54		27·07		22·44	9·91	102·2
With compost HF1 ...	6·27	1·48	4·26	11·32	4·88	12·74		26·39		19·15	8·96	92·4
Mean	6·95	1·38	5·62	11·58	4·45	14·53		26·41		22·90	9·70	100·0
Standard error	0·30	—	0·08	0·41	0·19	0·65		0·38		1·38	0·38	3·9
Significant difference ...	0·85 (P=·05)	—	0·295 (P=·01)	—	0·42 (P=·001)	—		—		—	—	—
(b) SUB-PLOTS							CROP FAILED		CROP FAILED			
Planting :												
Deep with ball of earth...	6·22	1·26	4·97	11·20	3·76	14·36		25·83		22·30	9·27	95·5
Deep with bare roots ...	6·50	1·10	5·02	10·54	3·87	13·37		24·85		21·38	8·89	91·6
At nursery level :												
With ball of earth ...	7·85	1·68	6·35	12·03	5·80	15·10		26·81		24·07	10·28	105·9
Bare roots	7·24	1·49	5·32	12·56	4·36	15·29		28·14		23·86	10·32	106·3
Mean	6·95	1·38	5·62	11·58	4·45	14·53		26·41		22·91	9·71	100·0
Standard error	1·17	—	0·009	0·21	0·32	0·32		2·33		0·93	0·25	2·6
Significant difference ...	3·31 (P=·05)	—	0·32 (P=·01)	1·82 (P=·01)	0·62 (P=·01)	0·91 (P=·05)		—		—	0·72 (P=·05)	7·4 (P=·05)

*H3F1 = Holed three months and filled one month before planting.
†HF1 = Holed and refilled one month before planting.
Deep planting = Planting 6 inches below nursery level.

(*N.B.*—So far as this experiment is concerned "deep planting" means planting so that the first lateral roots are at 6 inches below the normal surface of the soil, "nursery level" means planting so that the first lateral roots are not more than one inch below the normal surface of the soil.

Prior to 1935 it was a common plantation practice to plant so that the first lateral roots were at a point one foot or more below soil surface, planting at 2½—3 feet has been known. In such cases the adverse effect on yield of such a practice would be much more marked than has been shown in the experiment.

Observations on deeply planted coffee in the district show that only rarely are adventitious roots developed.)

Experiment II.—*Seedling Selection Trials*

The object of this experiment is to ascertain whether the seedling progeny of certain trees, from various districts, which have been selected for high yielding capacity over a number of years, or for desirable bean characteristics, will repeat the performance of the parent tree under the conditions existing at this Station, and also to compare these selections.

The whole experiment is under light shade consisting of *Cordia Holstii* and *Albizzia maranguensis.*

Summaries of the results are given on pages 6 to 11.

Latin Square I.—Planted May, 1938. Single Stem.

Summary of Results for 1941-1947

Calculated yields per acre of the original parent trees from which seed taken.

F 502 = 7·13 cwt. clean per acre over 7 years, Kikafu, Moshi District.
P 280 = 15·00 „ „ „ 5 „ Mbosi, Mbeya „
P 313 = 11·88 „ „ „ 5 „ „ „ „
P 348 = 12·32 „ „ „ 5 „ „ „ „
P 147 = 13·17 „ „ „ 5 „ „ „ „
P 190 = 13·34 „ „ „ 5 „ „ „ „

Calculated yields per acre, in cwts., clean coffee

Progeny plots from seed tree numbered :—	1941	1942	1943	1944	1945	1946	1947	Mean of 7 years 1941–1947	
								Cwt.	Percentage
F502	1·32	2·65	6·82	8·42	3·94	5·02	16·32	6·35	131·5
P280	1·21	4·35	7·01	7·87	2·55	4·85	13·84	5·95	123·2
P313	0·95	4·60	6·17	8·30	2·57	4·45	13·78	5·83	120·7
P348	0·84	2·07	4·43	6·38	1·19	5·31	9·75	4·28	88·6
P147	0·73	1·57	3·82	5·96	1·54	4·20	10·09	3·98	82·4
P190	0·77	1·29	1·53	3·69	0·87	3·63	6·56	2·62	54·2
Mean	0·97	2·76	4·96	6·77	2·10	4·58	11·72	4·83	100·0
Standard error	—	0·29	0·33	0·42	0·38	0·51	0·73	0·28	5·8
Significant difference	—	1·55 (P=·001)	0·96 (P=·05)	1·24 (P=·05)	1·12 (P=·05)	—	2·17 (P=·05)	0·83 (P=·05)	17·2 (P=·05)

Latin Square II.—Planted October, 1938. Single Stem.

Summary of Results for 1942-1947.

Calculated yields per acre of the original parent trees from which seed taken.

H	133 =	15·04 cwt. clean per acre over	4	years,	Machame,	Moshi District.
L	1 =	11·44 „ „	8	„	Kibosho, „	„
F	839 =	9·39 „ „	7	„	Kikafu, „	„
N	39 =	16·83 „ „	7	„	Kilema, „	„
P	147 =	13·17 „ „	5	„	Mbosi, Mbeya	„
E	59 =	7·50 „ „	7	„	Boloti, Moshi	„

Calculated yields per acre, in cwts., clean coffee

Progeny plots from seed tree numbered :—	1941	1942	1943	1944	1945	1946	1947	Mean of 6 years 1942–1947	
								Cwt.	Percentage
H133	—	1·56	4·67	4·57	1·45	3·18	13·37	4·77	107·2
L1	—	1·13	4·86	4·42	2·05	3·52	14·42	5·07	113·9
F839	—	1·11	4·78	5·39	3·91	2·38	15·38	5·49	123·4
N39	—	0·93	3·09	3·35	3·46	3·04	12·86	4·46	100·2
P147	—	0·76	2·78	4·28	0·88	3·29	10·17	3·69	82·9
E59	—	0·69	2·04	3·94	0·88	3·20	8·62	3·23	72·5
Mean	—	1·03	3·71	4·29	2·10	3·10	12·47	4·45	100·0
Standard error	—	0·27	0·37	0·24	0·33	0·44	0·69	0·19	4·3
Significant difference P = ·05	—	—	1·08	0·70	0·99	—	2·02	0·56	12·6

Latin Square III.—Planted October, 1938. Single Stem.

Summary of Results for 1942-1947

Calculated yields per acre of the original parent trees from which seed taken.

H 1 =	15·07 cwt., clean,	per acre	over	4 years,	Machame,	Moshi District.
F 840 =	8·76	,, ,,	,,	7 ,,	Kikafu,	,, ,,
P 313 =	11·88	,, ,,	,,	5 ,,	Mbosi,	Mbeya ,,
N 69 =	13·75	,, ,,	,,	7 ,,	Kilema,	Moshi ,,
N 50 =	15·20	,, ,,	,,	7 ,,	,,	,, ,,
E 665 =	6·57	,, ,,	,,	7 ,,	Boloti,	,, ,,

Calculated yields per acre, in cwts., clean coffee

Progeny plots from seed tree numbered :—	1942	1943	1944	1945	1946	1947	Mean of 6 years 1942–1947	
							Cwt.	Percentage
H 1	1·34	4·85	8·36	3·64	1·82	15·78	5·97	123·6
F840	0·90	4·57	7·87	3·65	3·44	15·96	6·06	125·5
P313	3·13	4·30	5·87	0·75	2·29	11·24	4·59	95·0
N69	1·83	5·42	5·06	1·53	3·37	11·89	4·84	100·2
N50	1·54	4·77	4·55	1·08	2·61	10·81	4·23	87·6
E665	1·40	2·44	4·24	0·55	2·78	8·51	3·32	68·7
Mean	1·69	4·39	5·99	1·87	2·72	12·37	4·83	100·0
Standard error	0·26	0·33	0·44	0·37	0·45	1·07	0·34	7·0
Significant difference	1·39 (P=·001)	0·96 (P=·05)	1·30 (P=·05)	1·08 (P=·05)	—	3·14 (P=·05)	1·00 (P=·05)	20·7 (P=·05)

Latin Square IV.—Planted 1939. Single Stem.

Summary of Results for 1942-1947

Calculated yields per acre of the original parent trees from which seed taken.

N 81 = 11·23 cwt., clean, per acre over 7 years, Kilema, Moshi District.
N 39 = 16·83 „ „ „ 7 „ „ „ „
L 1 = 11·44 „ „ „ 8 „ Kibosho, „ „
H 1 = 15·07 „ „ „ 4 „ Machame, „ „
N 197 = 13·88 „ „ „ 7 „ Kilema, „ „
R 3 = 18·38 „ „ „ 7 „ Machame, „ „

Calculated yields per acre, in cwts., clean coffee

Progeny plots from seed tree numbered :—	1942	1943	1944	1945	1946	1947	Mean of 6 years 1942–1947	
							Cwt.	Percentage
N81	0·94	1·56	2·78	0·01	1·28	6·60	2·19	77·9
N39	0·05	0·61	1·81	0·09	0·62	6·52	1·62	57·7
L1	0·75	1·65	3·53	0·12	1·59	10·27	2·99	106·4
H1	0·81	3·78	6·23	2·16	0·88	13·41	4·46	158·7
N197	0·55	2·19	3·37	0·12	2·61	10·51	3·22	114·6
R3	0·98	2·16	2·39	0·04	1·34	7·35	2·38	84·7
Mean	0·68	1·91	3·35	0·42	1·39	9·11	2·81	100·0
Standard error	0·08	0·17	0·25	—	0·26	0·71	0·18	6·4
Significant difference	0·44 (P=·001)	0·50 (P=·05)	0·74 (P=·05)	—	0·77 (P=·05)	2·10 (P=·05)	0·54 (P=·05)	19·2 (P=·05)

Randomized Block I.—Planted April, 1939. Single Stem.

Summary of Results for 1942-1947

Calculated yields per acre of the original parent trees from which seed taken.

R 11 = 11·71 cwt., clean, per acre over 7 years, Machame, Moshi District.
R 2 = 14·02 ,, ,, ,, 7 ,, ,, ,, ,,
H 61 = 14·49 ,, ,, ,, 4 ,, ,, ,, ,,
R.R.H. = Not known. Parent vigorous and produced large bean.
R 13 = 24·22 cwt., clean, per acre over 7 years, Machame, Moshi District.
H 133 = 15·04 ,, ,, ,, 4 ,, ,, ,, ,,
J 104 = 10·81 ,, ,, ,, 6 ,, ,, ,, ,,
N 106 = 12·13 ,, ,, ,, 7 ,, ,, ,, ,,
N 5 = 14·55 ,, ,, ,, 7 ,, ,, ,, ,,

Calculated yields per acre, in cwts., clean coffee

Progeny plots from seed tree numbered :—	1942	1943	1944	1945	1946	1947	Mean of 6 years, 1942–47	
							Cwt.	Percentage
R11	0·83			1·95	1·17	9·65	2·48	88·3
R2	0·65			1·68	1·32	9·51	2·41	85·8
H61	0·72			5·94	1·21	13·93	3·92	139·5
R.R.H.	0·87	Crop Failed	Crop Failed	4·10	1·74	14·27	3·80	135·2
R13	0·82			1·86	1·34	11·71	2·93	104·3
H133	0·91			1·87	1·32	11·49	2·92	103·9
J104	0·80			1·51	1·44	10·38	2·65	94·3
N106	0·55			1·36	1·24	9·42	2·30	81·9
N5	0·46			1·47	0·70	7·81	1·87	66·5
Mean	0·74			2·42	1·27	10·90	2·81	100·0
Standard error	0·12			0·41	0·21	0·71	0·15	5·3
Significant difference	0·21 (P. = ·02)			1·18 (P. = ·05)	— (P. = ·05)	2·03 (P. = ·05)	0·42 (P. = ·05)	14·9

Randomized Block II.—Planted April, 1939. Single Stem.

Summary of Results for 1942-1947

Calculated yields per acre of the original parent trees from which seed taken.

N	100	= 13·58	cwt., clean, per acre over	7	years,	Kilema,	Moshi	District.
N	217	= 13·59	,, ,, ,,	7	,,	,,	,,	,,
R	1	= 13·53	,, ,, ,,	7	,,	Machame	,,	,,
N	229	= 12·63	,, ,, ,,	7	,,	Kilema	,,	,,
N	34	= 15·19	,, ,, ,,	7	,,	,,	,,	,,
E	325	= 7·69	,, ,, ,,	7	,,	Boloti	,,	,,
N	182	= 12·76	,, ,, ,,	7	,,	Kilema,	,,	,,
N	215	= 14·08	,, ,, ,,	7	,,	,,	,,	,,
J	49	= 12·41	,, ,, ,,	6	,,	Machame,	,,	,,

Calculated yields per acre, in cwts., clean coffee

Progeny plots from seed tree numbered :—	1942	1943	1944	1945	1946	1947	Mean of 6 years 1942–47	
							Cwt.	Percentage
N100	1·27			0·55		10·11	2·59	116·1
N217	1·58			0·59		9·38	2·41	108·1
R1	1·13			0·48		9·15	2·41	108·1
N229	0·89			0·33		7·79	2·06	92·4
N34	1·24			0·45		9·33	2·27	101·8
E325	0·52			0·63		6·87	1·79	80·3
N182	0·83			0·62		6·88	1·78	79·8
N215	1·03			0·49		8·06	2·10	94·2
J49	1·37			0·64		10·26	2·70	121·1
Mean	1·10	Crop Failed	Crop Failed	0·53	Crop Failed	8·64	2·23	100·0
Standard error	0·17			—		0·77	0·13	5·8
Significant difference (P = ·05)	0·53			—		2·22	0·36	16·1

Over a period of 7 years in the case of those progeny plots in Latin Square I and 6 years in the cases of those in the remaining squares and randomized blocks, some progeny plots have given significantly higher yields than others, for example in Latin Square I the seedling progeny plots of F502, P280 and P313 are significantly better than those of P348, P147 and P190; and those of P348 and P147 are better than P190. The poor performance of the trees in the Randomized Blocks I and II in the previous years is probably a result of poor soil conditions, this may have been due to cultivation, and consequent erosion, during previous ownership of the land.

Sufficient information has now been accumulated to warrant taking individual tree records within the progeny plots which have yielded well, this will be done with a view to finding trees of better performance than the original parent.

EXPERIMENT IIIA.—*Seedlings* versus *Clones—Planted 1942—Single Stem*

The object of this experiment is to compare the yields obtained from seedlings and clones of the same parent tree.

This experiment has light shade consisting of *Maesopsis eminii* and *Albizzia maranguensis*.

The results to date are given below :—

Calculated yields in cwt., clean, per acre

	1945	1946	1947	Summary of Results Mean of 3 years 1945-1947
Clones	3·17 ...	Crop failed ...	5·45 ...	2·87
Seedlings	2·06 ...	,, ,, ...	4·66 ...	2·24
Mean	2·62 ...	,, ,, ...	5·06 ...	2·56
Standard error ...	0·23 ...	,, ,, ...	0·17 ...	0·10
Significant Difference (P=·05)	0·75 ...	,, ,, ...	0·55 ...	0·31

No conclusion can yet be drawn as to the relative merits of clones and seedlings although to-date the result is in favour of clones.

EXPERIMENT V

The experiment is designed to determine the effects on yield of mulch, compost and Sulphate of Ammonia in all possible combinations at the quantity levels (3) stated below.

No shade. Single Stem. Planted 1940.

Treatments:—(Per tree).

Mulch : M0=Nil.
M1=40 lbs. dry elephant grass.
M2=80 lbs.dry elephant grass.

Compost : C0=Nil.
C1=1 debe compost.
C2=2 debes compost.

	1940-42	1943-45	1946-47
Nitrogen : N0=Nil.	...	Nil.	... Nil.
N1=1 oz.	...	2 ozs.	... 3 ozs. sulphate of ammonia.
N2=2 ozs.	...	4 ozs.	... 6 ozs. sulphate of ammonia.

The Sulphate of Ammonia has been applied after 15 inches of rain has fallen during April.

The analysis of this experiment was done by the Statistical Department of Rothamsted Experimental Station, the results for 1947 and a summary of the results, 1942-1947, are shown in the tables below and are given in cwt. clean coffee per acre.

1947—Results adjusted for block effects

TABLE I

	N0			N1			N2		
	C0	C1	C2	C0	C1	C2	C0	C1	C2
M0	7·390	12·982	10·576	9·268	15·141	12·953	11·544	11·484	11·924
M1	8·895	12·950	15·857	11·297	9·995	15·143	10·422	13·132	10·633
M2	14·509	10·483	11·955	12·218	14·089	10·810	9·698	12·799	13·307

TABLE II

Interaction for Mulch and Compost adjusted for block effects

	Compost			Mean
Mulch	0	1	2	∓0·542
0	9·400	13·201	11·817	11·473
1	10·205	12·026	13·878	12·036
2	12·142	12·457	12·024	12·208
Mean ∓0·542	10·582	12·562	12·573	11·906

Standard error for the body of table ∓0·939

TABLE III

Interaction for Mulch and Nitrogen (Sulphate of Ammonia) adjusted for block effects

	Nitrogen (Sulphate of Ammonia)			Mean
Mulch	0	1	2	∓0·542
0	10·315	12·454	11·650	11·473
1	12·568	12·145	11·396	12·036
2	12·316	12·372	11·935	12·208
Mean ∓0·542	11·732	12·324	11·660	11·906

Standard error for the body of table ∓0·939

TABLE IV

Interaction for Compost and Nitrogen (Sulphate of Ammonia) adjusted for block effects

	Nitrogen (Sulphate of Ammonia)			Mean
Compost	0	1	2	∓0·542
0	10·264	10·928	10·555	10·582
1	12·138	13·075	12·471	12·562
2	12·796	12·968	11·954	12·573
Mean ∓0·542	11·732	12·324	11·660	11·906

Standard error for the body of table ∓0·939

Tables V to VIII below give the Summary of results—Mean yields for the 6 years 1942-47, adjusted for block effects

TABLE V

	N0			N1			N2		
M0	4·437	5·517	5·265	3·863	5·407	4·993	4·580	3·987	4·508
M0	4·437	5·517	5·265	3·863	5·407	4·993	4·580	3·987	4·508
M1	4·565	5·444	5·583	4·862	4·487	5·140	4·456	5·436	4·275
M2	5·333	4·437	4·860	4·870	5·200	4·028	3·555	5·193	4·918

TABLE VI

Interaction for Mulch and Compost adjusted for block effects

	Compost			Mean
Mulch	0	1	2	∓0·121
0	3·960	4·971	4·923	4·619
1	4·627	5·122	5·000	4·916
2	4·586	4·949	4·602	4·713
Mean ∓0·121	4·390	5·015	4·842	4·750

Standard error for the body of table ∓0·209

TABLE VII

Interaction for Mulch and Nitrogen (Sulphate of Ammonia) adjusted for block effects

	Nitrogen (Sulphate of Ammonia)			Mean
Mulch	0	1	2	∓0·121
0	4·741	4·754	4·358	4·619
1	5·198	4·829	4·722	4·916
2	4·882	4·700	4·555	4·713
Mean ∓0·121	4·941	4·761	4·545	4·750

Standard error for the body of table ∓0·209

TABLE VIII

Interaction for Compost and Nitrogen (Sulphate of Ammonia) adjusted for block effects

	Nitrogen (Sulphate of Ammonia)			Mean
Compost	0	1	2	∓0·121
0	4·445	4·530	4·196	4·390
1	5·139	5·033	4·872	5·015
2	5·237	4·720	4·567	4·842
Mean ∓0·121	4·941	4·761	4·545	4·750

Standard error for the body of table ∓0·209

The comments made on the results are as follows :—

"Mulching has usually led to an increase in yield, the lower level giving the better result.

Nitrogen has usually decreased the yield.

Compost has generally led to an increase in yield, although this was small in the first years of the experiment. The difference between the two rates of application seems to be of little importance".

In connection with the statement that the lighter mulch treatment has given the better result so far, it is of interest to note that this treatment usually ceases to give an effective cover for the soil by the onset of the dry season of January to March.

The annual results show that the mulch and compost treatments have increased yields in all years whereas in 1947 only has Sulphate of Ammonia effected an increase. Taking the whole period of the experiment compost is the only treatment to show a significant increase (P = ·05).

Experiment VI.—*Manurial Experiment*

Planted 1941, with clonal material but not from parents selected for yield. Single Stem.

This experiment is designed to determine the effects of various quick acting nitrogenous manures at different rates of application and at different dates of application.

Treatments :

Source of Nitrogen.

Number 1=Sulphate of Ammonia.
,, 2=Nitrochalk.
,, 3=Ammonium Nitrate.

Rates of application (in ozs. per tree) :—

	Sulphate of Ammonia	Nitrochalk	Ammonium Nitrate
Rate No. 1=	3	4	1·87
,, ,, 2=	6	8	3·75
,, ,, 3=	9	12	5·60

Time of Application:—

Number 1=In equal quantities in mid-April and May.
,, 2=All in May.
,, 3=In equal quantities in May and November.

This experiment has shade consisting of *Maesopsis eminii, Albizzia stipulata* and *Albizzia maranguensis*.

The treatments were applied in 1946 and 1947 but the natural yields are available for the years 1942-45. There was no crop in 1946, the effect of the treatment applied in 1946 is reflected in the 1947 crop.

The data was submitted to the Statistical Department, Rothamsted Experimental Station for analysis and they comment as follows : "Little comment is necessary on the results of the experiment to-date. No differences between the general effects of the three fertilizers have appeared, and the effect of varying the quantity of nitrogen seems to be small. With regard to time of application, the three fertilizers behaved differently; Sulphate of Ammonia gives best results when applied in two halves, one in May and the other in November, whereas Nitrochalk was best applied in April. The time of application of Ammonium nitrate showed little or no effect".

It should be noted here that in other experiments (XIVa and V) Sulphate of Ammonia has, on the whole, had a depressing effect on yield when applied in April-May.

The analysis is given below (yields are expressed in cwt. clean coffee per acre, using actual out-turn).

Table I

	Rates of application			Mean
Source of nitrogen	1	2	3	∓0·512
1 (Sulphate of Ammonia) ...	8·17	9·44	10·24	9·29
2 (Nitrochalk)	10·77	8·42	9·41	9·53
3 (Ammonium Nitrate) ...	9·19	8·95	10·76	9·63
Mean ∓ ·512 ...	9·38	8·93	10·14	9·48

TABLE II

Source of nitrogen	Time 1	2	3	Mean ∓0·512
1 (Sulphate of Ammonia) ...	8·14	9·00	10·70	9·29
2 (Nitrochalk)	11·77	8·98	7·85	9·53
3 (Ammonium Nitrate) ...	9·42	10·16	9·31	9·63
Mean ∓ ·512 ...	9·77	9·38	9·29	0·48

TABLE III

Rate of application	Time 1	2	3	Mean ∓0·512
1	9·43	9·53	9·16	9·38
2	8·97	8·71	9·11	8·93
3	10·93	9·89	9·59	10·14
Mean ∓ ·512 ...	9·77	9·38	9·29	0·48

Average standard error of entries in body of table ∓0·885

EXPERIMENT IX

This experiment is designed to determine the effects of various methods of cultivation.

Planted 1934. Seedling material.

No shade has been planted. Until May, 1944 the coffee in this experiment was grown in single stem; it was then converted to multiple stem.

The treatments are carried out at the end of the long rains each year; digging with forked hoe and hoe is done to a depth of 6 inches. The "no cultivation" plots have the weeds slashed only.

Over the period of 10 years there is no significant difference between the yields of the plots under the various treatments.

The summary of results is shown on page 17.

Summary of Results 1938-1947

Yields in cwt., clean, per acre

	* 1938	* 1939	* 1940	* 1941	* 1942	* 1943	* 1944	* 1945	* 1946	† 1947	Summary of Results 1938-1947	Summary of Results Percentages
Treatment:												
A. Forked hoe (forked jembe)	5·77	0·27	2·60	9·23	1·86	7·86	Converted to Multiple Stem	6·28	Crop Failed	24·17	5·72	111·1
B. West Indian hoe (jembe)	5·79	0·48	2·74	8·23	2·43	7·73		6·60		22·14	5·53	107·4
C. No cultivation ...	5·61	0·41	2·20	9·16	1·90	7·17		5·79		17·79	4·93	95·8
D. Envelope forked ...	4·55	0·35	1·67	7·32	1·63	5·26		5·29		21·47	4·80	93·2
E. Trenching	4·81	0·45	2·11	9·33	1·38	5·80		5·24		19·49	4·75	92·4
Mean	5·31	0·39	2·26	8·66	1·84	6·76		5·84		21·01	5·15	100·0
Standard error	—	—	0·34	0·33	0·10	0·12		0·62		1·689	0·402	7·8
Significant difference (P=·05) ...	—	—	1·05	—	—	—		—		—	—	—

*16 per cent out-turn.

†Actual out-turn.

EXPERIMENT X.—*Artificial Shade—Clonal Material but not from trees selected for yield—Planted 1934*

This experiment is still in abeyance owing to the very high cost of the material.

EXPERIMENT XII.—*Selection in Nursery—Planted 1935—Seedling Material*

This experiment is designed to investigate the value of selection in the Nursery.

No shade has been planted. Over a period of 10 years the yields of the plots in this experiment have shown no significant differences but the yields indicate that it is sound practice to select for planting material which has both good tops and good root systems.

The results to date are summarised in the table on page 19.

Summary of Results 1938-1947

Yields in cwt., clean, per acre—(Out-turn used—16 per cent)

	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	Mean of 10 years	
											1938-1947	Percentages
PLOTS :												
Tops cut back	2·84	0·81	4·62	5·83	3·45	5·86	5·19	4·99	4·20	11·13	4·89	93·1
Good tops and good roots	5·77	0·75	4·40	8·67	2·96	9·26	4·48	5·74	5·11	12·39	5·95	113·3
Average	4·07	0·57	4·55	7·23	2·94	6·55	4·48	6·29	5·67	12·95	5·53	105·3
Good tops and poor roots	4·62	0·62	5·37	7·00	3·22	6·01	5·01	4·65	4·92	11·36	5·28	100·6
Poor tops and good roots	3·66	0·57	4·84	6·07	2·45	6·39	4·71	5·56	5·02	10·58	4·98	94·9
Poor tops and poor roots	2·89	0·69	4·51	6·59	2·39	5·09	5·22	6·49	4·16	10·76	4·88	93·0
Mean	3·98	0·67	4·72	6·90	2·90	6·53	4·85	5·62	4·85	11·53	5·25	100·0
Standard error	—	—	0·413	0·87	0·55	0·75	0·44	1·02	1·24	1·14	0·38	7·2
Significant difference	—	—	—	—	—	—	—	—	—	—	—	—

Experiment XIII

The object of this experiment is to compare the multiple stem system of growing *coffea arabica* with the single stem system with a view to learning—

(a) the most economical method as regards pruning.

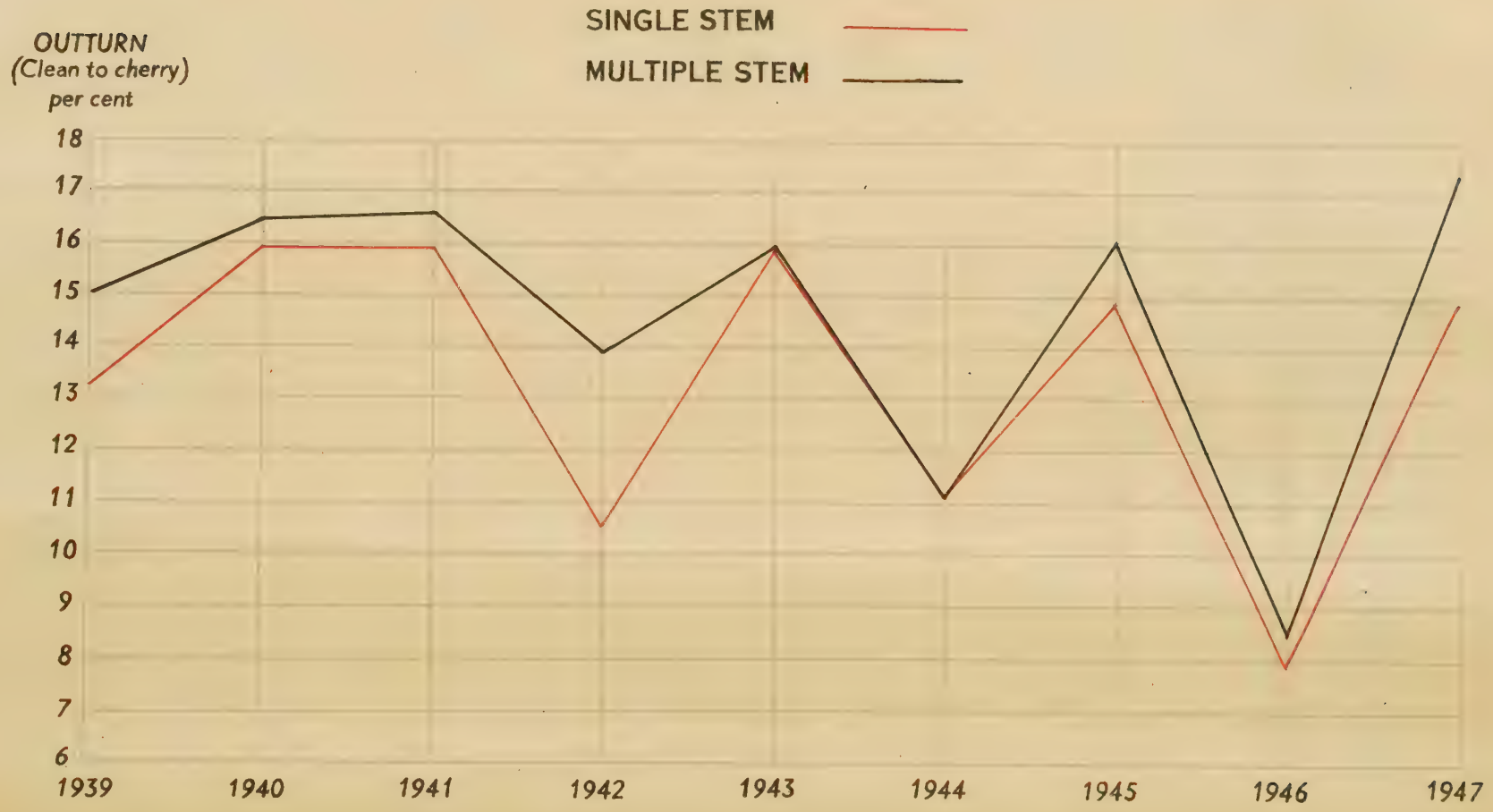
(b) the better yielding system, and

(c) the effect of the systems on out-turn (clean coffee to cherry).

Seedling material. Planted 1936.

The data relating to this experiment is given on page 21.

GRAPH SHOWING ANNUAL VARIATIONS IN OUTTURN.



Z.1161

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GRAPH SHOWING ANNUAL VARIATIONS IN YIELD.

Z.1161.

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Summary of Results 1939-1947

Yields in cwts., clean, per acre—based on actual Out-turn

	1939	1940	1941	1942	1943	1944	1945	1946	1947	Mean of 10 years 1938–47
Treatments :										
Single stem	1·982	2·996	7·290	3·991	5·318	5·319	9·589	1·04	20·492	5·836
Multiple stems, 3 suckers	2·348	11·928	12·962	12·034	17·238	5·677	7·079	2·30	29·578	10·136
Agobiada, multiple stem, 3 suckers	0·407	6·607	6·370	7·494	13·079	4·992	8·028	0·90	17·329	6·521
Mean	1·579	7·177	8·874	7·840	11·878	5·329	8·232	1·41	22·467	7·497
Standard error	0·301	0·493	0·700	0·401	0·843	0·127	1·013	0·312	0·410	0·268
Significant difference, P = ·05 ...	1·043	1·707	2·422	1·389	2·918	0·440	—	1·256	1·419	0·926

Yields were recorded in 1938 but were too small for comparison but these have been included in the "Mean of 10 years".

In addition to giving 75 per cent more crop over the 10-year period of the experiment, analysis of the bean samples show that trees grown on the multiple stem system produce a significantly higher proportion of Grade A. In assessing the economic returns of the two systems the very greatly reduced costs of pruning the multiple stem coffee must be taken into account.

The graphs overleaf show the variations, from season to season, in yield and out-turn in this experiment. The variations in out-turn from season to season are statistically significant.

Experiment XIVa

To study the effects on arabica coffee of applications of various mulches, with and without the addition of Sulphate of Ammonia.

Treatments :—

A—Control.

B—Banana trash—80 lbs. applied in June.

C—Elephant Grass—80 lbs. applied in June.

D—Guinea Grass 80 lbs. applied in June.

E—Compost—1 debe per tree applied in March.

Half plots receiving Sulphate of Ammonia in May each year.

Planted 1940—Clonal material but not from trees selected for yield—Single Stem.

This experiment is sparsely shaded with *Albizzia maranguensis*, *Sesbania* sp., which was planted as a temporary shade, has been uprooted and the *A. maranguensis* has not yet grown sufficiently to give a complete cover of light shade.

The annual yields under the various treatments are given in the table on page 23.

Summary of Results for Individual Years from 1942-1947

Yields in cwt., clean, per acre

N1 = Plots to which Sulphate of Ammonia applied in May.

N0 = Plots to which no Sulphate of Ammonia applied.

	1942			1943			*1944			*1945			*1946			*1947		Summary of 6 years 1942—1947*					
	Main plots	Sub-Plots		Main plots	Sub-Plots		Main plots	Sub-Plots		Main plots	Sub-Plots		Main plots	Sub-Plots		Main plots	Sub-Plots	Main Plots		Sub-Plots			
		N1	N0		N1	N0		N1	N0		N1	N0		N1	N0		N1	N0		Per-centages	N1	Per-centages	N0	Per-centages
Treatments:																							
A. Nil	1·73	1·80	1·66	4·86	4·68	5·04	0·05	0·04	0·07	10·63	11·82	9·43	0·14	0·06	0·23	12·92	11·50	14·35	5·01	92·7	4·93	91·2	5·08	94·1
B. Banana mulch† ...	2·09	1·87	2·31	4·46	4·09	4·82	0·70	0·56	0·84	11·34	11·90	10·77	0·63	0·36	0·90	14·64	13·30	15·97	5·58	103·2	5·29	97·9	5·87	108·6
C. Elephant grass† ...	1·77	1·73	1·80	4·61	4·55	4·67	0·37	0·23	0·50	11·95	11·50	12·40	0·16	0·13	0·19	14·20	14·76	13·64	5·46	101·0	5·44	100·6	5·48	101·4
D. Guinea grass† ...	2·05	1·90	2·21	5·02	4·18	5·87	0·94	0·35	1·53	9·83	11·25	8·40	0·59	0·35	0·83	16·02	16·89	15·14	5·67	104·9	5·77	106·7	5·57	103·1
E. Compost‡	1·26	1·22	1·29	4·93	4·23	5·63	0·08	0·06	0·10	10·63	10·75	10·52	0·03	0·03	0·04	15·11	17·03	13·18	5·30	98·2	5·51	102·1	5·09	94·3
Mean	1·78	1·70	1·85	4·78	4·34	5·21	0·43	0·25	0·61	10·87	11·44	10·30	0·31	0·19	0·44	14·58	14·70	14·46	5·40	100·0	5·39	99·7	5·42	100·3
Standard error ...	0·052	0·009	0·009	0·22	0·13	0·13	0·093	0·329	0·329	0·808	0·409	0·409	0·081	0·070	0·070	1·216	1·229	1·229	0·292	5·4	0·254	4·7	0·254	4·7
Sig. diff. (P=·05) ...	—	—	—	—	0·36	0·36	0·287	—	—	—	1·208	1·208	0·246	0·207	0·207	—	3·627	3·627	—	—	—	—	—	—

*Results Computed on actual out-turn basis. †80 lb. per tree. ‡1 Debe per tree.
Remainder on 16 percent.

Rates of application of sulphate of ammonia.

1941	...	2 ozs. per tree.
1942	...	2 „ „
1943	...	4 „
1944	...	4 „ „
1945	...	4 „ „
1946	...	8 „ „
1947	...	8 „ „

In the 1947 season the compost treatment proved significantly better than the nil or banana trash treatments and the guinea grass mulch significantly better than the nil treatment. Sulphate of Ammonia was effective in increasing yields significantly only when used in combination with compost.

Taking the whole period of the experiment, however, it will be seen that the various treatments and interactions are significant in different years but none of them have, so far, had any long term effect.

No satisfactory reason can be found at present for the differences in the response to mulches in this experiment compared with that recorded for Experiments XV or V. It may be that the application of 80 lbs. per tree combination, on arabica coffee.

Liquoring.—Samples were submitted to Mr. Devonshire, Liquorer for the Kenya Coffee Board, who classified them as follows :—

Treatment	Liquorer's Classification
A	2 -
A/N	2 -
B	2
B/N	3
C	2 -
C/N	2 -
D	3
D/N	3
E	2 -
E/N	3 -

The differences in the classifications of these samples are too small to allow of any conclusions to be drawn as to the effect of any one treatment on liquoring.

Experiment XV

To ascertain the effects of Irrigation and Mulching, separately and in combination, on arabica coffee.

Clonal material, not from parents selected for yield. No shade. Single Stem. Planted 1940.

Treatments :—

Irrigation :

0 = No treatment.
1 = Rainfall made up to 2 inches monthly.
2 = Rainfall made up to 4 inches monthly.
3 = Rainfall made up to 2 inches fortnightly.

Mulch :

0 = No treatment.
1 = Banana trash 40 lbs. per tree applied in June.
2 = Banana trash 80 lbs. per tree applied in June.
3 = Banana trash 40 lbs. per tree applied in June.
40 lbs. per tree applied in December.

The analysis of this experiment has been carried out by the Statistical Department of Rothamsted Experimental Station and is given in Tables I to VIII below.

Adjusted yield for Interaction of Irrigation and Mulch

Mean yield of 6 years—1942-1947 (in cwt., clean, per acre)

TABLE I

Mulch	Irrigation 0	1	2	3	Mean
0	1·18	4·26	4·68	4·10	3·55
1	3·40	6·00	5·73	5·70	5·21
2	3·25	5·44	5·29	5·93	4·98
3	3·14	5·87	5·26	5·41	4·92
Mean	2·74	5·39	5·24	5·28	4·66

Standard error of entries in body of table is ±0·320

Standard error of marginal means is ±0·160

Mean yields for Irrigation in cwt., clean, per acre

TABLE II

Irrigation	1942	1943	1944	1945	1946	1947	Mean 1942-47
0	1·19	4·91	1·55	1·72	0·51	6·57	2·74
1	1·56	7·63	2·91	1·39	3·47	15·38	5·39
2	1·68	7·70	3·00	1·18	3·39	14·48	5·24
3	1·72	6·33	3·49	0·62	3·04	16·50	5·28
Mean	1·54	6·64	2·74	1·23	2·60	13·23	4·66
Standard error	0·124	0·386	0·160	0·166	0·186	0·590	0·160
Significant difference (P=·05)	0·367	1·142	0·474	0·491	0·550	1·746	0·475

Mean yields for Mulch in cwt., clean, per acre

TABLE III

Mulch	1942	1943	1944	1945	1946	1947	Mean 1942-47
0	0·75	4·69	2·07	1·70	2·19	9·93	3·55
1	1·72	7·76	2·68	1·01	3·27	14·78	5·21
2	2·07	7·60	2·84	1·13	2·20	14·03	4·98
3	1·60	6·52	3·36	1·07	2·74	14·19	4·92
Mean	1·54	6·64	2·74	1·23	2·60	13·23	4·66
Standard error	0·124	0·386	0·160	0·166	0·186	0·590	0·160
Significant difference (P=·05)	0·367	1·142	0·474	0·491	0·550	1·746	0·475

Mean yields for Clone (Yield in cwt., clean, per acre)

TABLE IV

Clone	1942	1943	1944	1945	1946	1947	Mean 1942-49
KIL 50	1·45	5·73	2·57	1·01	2·33	12·05	4·19
KIL 98	1·57	6·82	2·86	1·28	2·81	13·56	4·82
KIL 48	1·50	6·14	2·80	1·15	2·86	13·53	4·66
KIL 10	1·62	7·88	2·73	1·47	2·41	13·80	4·99
Mean	1·54	6·64	2·74	1·23	2·60	13·23	4·66
Standard error	0·124	0·386	0·160	0·166	0·186	0·590	0·160
Significant difference (P=·05)	—	1·142	—	—	—	—	0·475

Adjusted yield for Interaction of Irrigation and Clone

Mean of 6 years—1942-1947 (in cwt., clean, per acre)

TABLE V

Clone	Irrigation 0	1	2	3	Mean
KIL 50	2·29	5·12	4·78	4·56	4·19
KIL 98	3·02	5·64	5·07	5·54	4·82
KIL 48	3·12	5·07	5·06	5·41	4·66
KIL 10	2·54	5·73	6·05	5·63	4·99
Mean	2·74	5·39	5·24	5·28	4·66

Standard error of entries in body of table is ∓0·320

Standard error of marginal means is ∓0·160

Adjusted yield for Interaction of Mulch and Clone

Mean yield of 6 years—1942-1947 (in cwt., clean, per acre)

TABLE VI

Clone	Mulch 0	1	2	3	Mean
KIL 50	3·11	4·87	3·91	4·85	4·19
KIL 98	3·68	5·25	4·95	5·40	4·82
KIL 48	3·42	5·30	5·33	4·61	4·66
KIL 10	4·01	5·40	5·72	4·81	4·99
Mean	3·55	5·21	4·98	4·92	4·66

Standard error of entries in body of table is ∓0·320

Standard error of marginal means is ∓0·160

The results, season by season, of the lighter irrigation and mulch treatments are given in Table VII on page 27.

TABLE VII

Yields adjusted for row and column differences and expressed in cwt., clean, per acre.

MULCH	IRRIGATION													
	1942		1943		1944		1945		1946		1947		Mean 1942–47	
	0	1	0	1	0	1	0	1	0	1	0	1	0	1
0	0·38	0·66	2·22	4·95	— 0·05*	2·55	2·61	1·54	— 0·30*	3·42	2·19	12·43	1·18	4·26
1	1·42	1·80	5·76	8·29	1·72	2·99	1·97	0·86	1·21	4·33	8·31	17·76	3·40	6·00

*The adjusted value of this treatment is due to the fact that the treatment was effectively a failure in spite of being in good rows and columns.

An analysis of the effects of irrigation and mulch at the various levels is commented on as follows:—"It appears that the greater part of the total effect, both of irrigation and mulching, is represented by the contrast between presence and absence of the treatment. The difference (presence-absence) is positive for each treatment in every year except 1945, and is always significant. The remaining components are of much less importance; and change from year to year. It seems likely that the different irrigation and mulching treatments are of very similar value when averaged over a number of seasons.

Various interactions (between mulch, irrigation and clone) are significant in different years, but none of them appear to have any large long term effect. It is worth noting, however, that the plots receiving no irrigation or mulching vary from year to year in a regular biennial cycle quite different from the yearly behaviour of the treated plots. This may be seen from Table VIII below, which does not allow for row and column differences".

TABLE VIII

Average yields, cwt., clean, per acre

	1942	1943	1944	1945	1946	1947
Plots without irrigation or mulching	0·40	2·32	0·16	2·51	0·34	2·31
Remainder	1·61	6·93	2·91	1·15	2·75	13·96

Table VIII indicates that biennial bearing may be overcome to a certain degree by mulching and irrigation or a combination of these treatments. Analysis of the yields of the 4 clones concerned using a method employed by Hoblyn and others[1] to evaluate the intensity of the biennial habit shows that there is a difference in the propensity of the clones in this respect. Table IX shows the fluctuation in yield from year to year of these clones, in this method 100 per cent indicates complete biennial bearing, and 0 would indicate equal crops in each and every year and the Intensity figure is a measure of the degree of those fluctuations, in this case also 0 denotes equal crops and 1, no crop at all in the off year.

[1] Studies in Biennial Bearing—Hoblyn, Grubb, Painter and Wates—*Journal of Pomology*, Vol. XIV, No. 1.

Table IX

Biennial Bearing Studies of Certain Treatments in Experiment XV

Clone	*Treatment	Yields in cwt., clean, per acre						Degree of Intensity					Biennial Habit	Average Intensity
		1942	1943	1944	1945	1946	1947	1942–43	1943–44	1944–45	1945–46	1946–47	Per cent	
KIL 50 (Average yield per annum 4·2 cwt. clean per acre).	00	0·88+	2·80—	0·05+	0·75—	0·30+	1·83	0·52	0·96	0·88	0·43	0·72	100	0·70
	01	3·16+	8·76—	2·42+	3·56—	1·26+	16·23	0·47	0·57	0·19	0·48	0·86	100	0·51
	10	0·86+	4·64—	4·16—	0·52+	2·70+	19·13	0·69	0·05	0·78	0·68	0·75	50	0·59
	11	3·25+	12·70—	6·28—	0·63+	9·86+	25·65	0·59	0·34	0·82	0·88	0·44	50	0·61
KIL 98 (Average yield per annum 4·8 cwt. clean per acre).	00	0·73+	3·16—	0·02+	1·30+	1·48+	5·38	0·62	0·99	0·97	0·06	0·57	50	0·64
	01	2·04+	7·87—	3·29—	3·26+	1·63—	15·48	0·59	0·41	0·00	0·33	0·81	50	0·43
	10	1·48+	8·87—	4·96—	2·39+	6·45+	20·00	0·71	0·28	0·35	0·46	0·51	50	0·46
	11	0·73+	6·34—	4·76—	1·31+	5·85+	30·36	0·79	0·14	0·57	0·63	0·68	50	0·56
KIL 48 (Average yield per annum 4·66 cwt. clean per acre).	00	0·17+	4·15—	0·20+	3·52—	0·28+	3·34	0·92	0·91	0·89	0·85	0·85	100	0·88
	01	1·38+	6·04—	1·34+	3·45—	0·14+	6·56	0·63	0·64	0·44	0·92	0·96	100	0·72
	10	0·85+	8·24—	2·48—	0·96+	3·57+	18·46	0·81	0·54	0·44	0·74	0·68	50	0·64
	11	4·65+	18·04—	4·77—	0·49+	7·92+	31·23	0·59	0·58	0·81	0·88	0·60	50	0·69
KIL 10 (Average yield per annum 4·99 cwt. clean per acre).	00	0·61+	3·89—	0·71+	9·56—	T +	3·38	0·94	0·69	0·86	1·00	1·00	100	0·90
	01	1·87+	11·48—	2·03+	2·23—	0·40+	11·20	0·72	0·70	0·05	0·70	0·93	100	0·62
	10	0·73+	7·51—	2·46+	6·08—	4·04+	16·73	0·82	0·51	0·42	0·20	0·61	100	0·51
	11	2·30+	13·53—	3·50—	2·11+	6·43+	20·62	0·71	0·59	0·25	0·51	0·52	50	0·52

*The first figure represents the Irrigation treatment.
The second figure represents the Mulch treatment.

Summary for all four clones

Treatment	Biennial Habit Per cent	Intensity
00 ...	88 ...	0·78
01 ...	88 ...	0·57
10 ...	63 ...	0·55
11 ...	50 ...	0·60

Table IX shows that KIL 98 so far is less prone to the biennial habit than either of the other 3 clones and the effect of the treatments, irrigation and mulch, have a much less marked effect in reducing its biennial habit as compared with the other clones. The summary for all 4 clones confirms the comments made on Table VIII.

Liquoring.—Samples from all plots in this experiment were submitted to Mr. Devonshire, Liquorer of the Kenya Coffee Board, who classified them as follows :—

the 1st figure represents the Irrigation Treatment and the 2nd figure represents the Mulch Treatment of the plots.

Plot		Class	Plot		Class
20	...	1–	02	...	3
10	...	1	22	...	2
00	...	1	01	...	2
13	...	1–	31	...	2
12	...	2+	30	...	2
11	...	2	21	...	2
03	...	2	23	...	2
32	...	2	33	...	2

The above classifications show that in the season 1947 the treatments, although increasing yields, did not materially reduce the standard of coffee produced.

Clonal Selection Trials—(Experiments IV and XVIII)

These trials are designed to compare the vegetatively propagated progeny (clones) of certain coffee trees which have been selected for their high yielding capacity over a number of years or for other desirable characteristics.

Experiment IV.—Clonal Selection Trial

This clonal selection trial has been under fairly heavy natural shade consisting of *Acrocarpus fraxinifolius*, *Cordia Holstii*, *Albizzia maranguensis*. The rather heavy shade together with the fact that coffee had previously been grown on the area, is probably responsible for the low yields. The shade has now been thinned.

The yields of the original parent are given for reference.

Calculated yields of original parents from which propagating material taken

Tree No.

N 39 yielded 16·83 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
R 3 yielded 18·38 cwt., clean, per acre, over 7 years, Machame, Moshi District.
L 1 yielded 11·44 cwt., clean, per acre, over 7 years, Kibosho, Moshi District.
N 100 yielded 13·58 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
N 197 yielded 13·88 cwt., clean, per acre, over 7 years, Kilema, Moshi District.

Latin Square V.—Planted 9th April, 1942—Single Stem

Yield in cwt., clean, per acre calculated on 16 per cent out-turn basis

Vegetative progeny plots of Tree No.		1945		1946		1947		Mean of 3 years 1945-47
N 39	...	2·47	...	Crop failed	...	3·28	...	1·92
R 3	...	4·37	...	do	...	8·52	...	4·30
L 1	...	3·86	...	do	...	9·58	...	4·48
N 100	...	2·97	...	do	...	9·74	...	4·24
N 197	...	4·23	...	do	...	10·09	...	4·77
Mean	...	3·58	...	do	...	8·24	...	3·94

Latin Square II.—Planted 13th April, 1943—Single Stem

N 39	...	1·11	...	Crop failed	...	4·84	...	1·98
R 3	...	1·31	...	do	...	6·56	...	2·62
L 1	...	1·40	...	do	...	8·21	...	3·20
N 100	...	1·19	...	do	...	7·64	...	2·94
N 197	...	1·64	...	do	...	8·08	...	3·24
Mean	...	1·33	...	do	...	7·07	...	2·80

Experiment XVIII.—Clonal Selection Trials—Planted 1943

This experiment has light shade consisting of *Maesopsis eminii, Cordia Holstii, Albizzia stipulata, Albizzia maranguensis* and *Ficus sycamorus.*

The yields for the respective seasons and a summary are given in the tables below. The yields of the original parents are given for reference. *Except where indicated figures have been calculated on the basis of 16 per cent out-turn*

Calculated yields of original parents from which propagating material taken

Tree No.

N 39 yielded 16·83 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
R 23 yielded 10·17 cwt., clean, per acre, over 7 years, Machame, Moshi District.
N 71 yielded 13·59 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
I 60 yielded 16·29 cwt., clean, per acre, over 2 years, Machame, Moshi District.
M 2 yielded 6·69 cwt., clean, per acre, over 4 years, Uru, Moshi District.
L 1 yielded 11·44 cwt., clean, per acre, over 8 years, Kibosho, Moshi District.

Latin Square I.—Planted 29th April, 1943—Single Stem

Yields in cwt., clean, per acre

Vegetative progeny plots of Tree No.	1945	1946	1947	Mean of 3 years 1945-47
N 39 ...	4·84 ...	1·30 ...	13·61* ...	6·58
R 23 ...	1·29 ...	1·44 ...	12·32 ...	5·02
N 71 ...	1·37 ...	2·18 ...	12·09 ...	5·21
I 60 ...	2·04 ...	3·52 ...	14·98 ...	6·84
M 2 ...	1·90 ...	3·37 ...	12·07 ...	5·78
L 1 ...	2·33 ...	2·04 ...	14·45 ...	6·27
Mean ...	2·29 ...	2·31 ...	13·25 ...	5·95

*=Using actual out-turn.

Calculated yields of original parents from which propagating material taken

Tree No.

N 20 yielded 17·12 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
N 30 yielded 12·54 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
N 29 yielded 14·39 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
N 5 yielded 14·55 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
N 48 yielded 32·04 cwt., clean, per acre, over 1 year, Kilema, Moshi District.
N 197 yielded 13·88 cwt., clean, per acre, over 7 years, Kilema, Moshi District.

Latin Square II.—Planted 30th April, 1943—Single Stem

Yield in cwt., clean, per acre

Vegetative progeny plots of Tree No.	1945	1946	1947	Mean of 3 years 1945-47
N 20 ...	1·44 ...	2·22 ...	10·54 ...	4·73
N 30 ...	2·98 ...	0·95 ...	10·54 ...	4·82
N 29 ...	3·03 ...	2·43 ...	12·31 ...	5·92
N 5 ...	5·29 ...	0·93 ...	12·92* ...	6·38
N 48 ...	2·06 ...	2·43 ...	10·81 ...	5·10
N 197 ...	4·17 ...	5·33 ...	14·07* ...	7·86
Mean ...	3·17 ...	2·39 ...	11·87 ...	5·81

*=Using actual out-turn.

Calculated yields of original parents from which propagating material taken

Tree No.

N 5 yielded 14·55 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
AB 35 yielded 8·81 cwt., clean, per acre, over 11 years, Meru, Arusha District.
KP 154 yielded 10·35 cwt., clean, per acre, over 10 years, C.R.S., Moshi, District.
KP 423 yielded 14·97 cwt., clean, per acre, over 10 years, C.R.S., Moshi District.
M 97 yielded 5·04 cwt., clean, per acre, over 4 years, Uru, Moshi District.
N 106 yielded 12·13 cwt., clean, per acre, over 7 years, Kilema, Moshi District.

Latin Square III.—Planted 26th October, 1944—Multiple Stem

Vegetative progeny plots of Tree No.		1947 Cwt., clean, per acre
N 5	...	6·26*
AB 35	...	4·56
KP 154	...	3·25
KP 423	...	6·82
M 97	...	5·51
N 106	...	5·79
Mean	...	5·37

*=Using actual out-turn.

Calculated yields of original parents from which propagating material taken

Tree No.

R 15 yielded 13·87 cwt., clean, per acre, over 7 years, Machame, Moshi District.
N 81 yielded 11·23 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
KP 228 yielded 9·74 cwt., clean, per acre, over 10 years, C.R.S., Moshi District.
I 49 yielded 10·45 cwt., clean, per acre, over 7 years, Machame, Moshi District.
S 16 yielded 3·75 cwt., clean, per acre, over 3 years, Kibosho, Moshi District.
N 34 yielded 15·19 cwt., clean, per acre, over 7 years, Kilema, Moshi District.

Latin Square VII.—Planted 7th June, 1943—Single Stem

Yield in cwt., clean, per acre

Vegetative progeny plots of Tree No.		1945		1946		1947		Mean of 3 years 1945-47
R 15	...	3·63	...	2·50	...	13·13*	...	6·42
N 81	...	3·76	...	3·65	...	15·43*	...	7·61
KP 228	...	2·80	...	2·80	...	14·62	...	6·74
I 49	...	2·14	...	1·43	...	10·78	...	4·78
S 16	...	2·32	...	0·95	...	10·43	...	4·57
N 34	...	1·68	...	1·90	...	10·57	...	4·72
Mean	...	2·73	...	2·21	...	12·49	...	5·81

*=Using actual out-turn.

Calculated yields of original parents from which propagating material taken

Tree No.

R 2 yielded 14·02 cwt., clean, per acre, over 7 years, Machame, Moshi District.
H 66 yielded 11·27 cwt., clean, per acre, over 4 years, Machame, Moshi District.
M 7 yielded 6·14 cwt., clean, per acre over 4 years, Uru, Moshi District.
AB 92 yielded 7·59 cwt., clean, per acre, over 11 years, Meru, Arusha District.
N 218 yielded 15·04 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
N 100 yielded 13·58 cwt., clean, per acre, over 7 years, Kilema, Moshi District.

Latin Square VIII.—Planted 13th August, 1943—Single Stem

Yield in cwt., clean, per acre

Vegetetive progeny plots of Tree No.		1945		1946		1947		Means of 3 years 1945-47
R 2	...	2·38	...	4·55	...	13·75	...	6·89
H 66	...	2·58	...	3·47	...	20·28*	...	8·78
M 7	...	1·46	...	3·48	...	11·24	...	5·39
AB 92	...	0·95	...	3·20	...	11·43	...	5·19
N 218	...	2·23	...	2·25	...	14·62	...	6·37
N 100	...	2·22	...	4·65	...	14·30*	...	7·06
Mean	...	1·97	...	3·59	...	14·27	...	6·61

*=Using actual out-turn.

Calculated yields of original parents from which propagating material taken

Tree No.

AC 98 yielded 7·35 cwt., clean, per acre, over 11 years, Meru, Arusha District.
R 3 yielded 18·38 cwt., clean, per acre, over 7 years, Machame, Moshi District.
KP 683 yielded 10·03 cwt., clean, per acre, over 10 years, C.R.S., Moshi District.
N 205 yielded 14·07 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
N 128 yielded 10·94 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
I 5 yielded 11·29 cwt., clean, per acre, over 7 years, Machame, Moshi District.

Latin Square IX.—Planted 20th December, 1943—Single Stem

Yield in cwt., clean, per acre

Vegetative progeny plots of Tree No.	1946	1947	Mean of 2 years 1946-1947
AC 98	4·07	9·54	6·81
R 3	5·22	10·12	7·67
KP 683	4·46	13·63	9·05
N 205	6·60	13·02	9·81
N 128	4·87	12·91	8·89
I 5	4·58	10·39	7·49
Mean	4·96	11·60	8·29

Tree No.

N 110 yielded 36·90 cwt., clean, per acre, over 1 year, Kilema, Moshi District.
M 95 yielded 7·37 cwt., clean, per acre, over 3 years, Uru, Moshi District.
KP 532 yielded 10·05 cwt., clean, per acre, over 10 years, C.R.S., Moshi District.
N 197 yielded 13·88 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
I 235 yielded 11·98 cwt., clean, per acre, over 7 years, Machame, Moshi District.
R 11 yielded 11·71 cwt., clean, per acre, over 7 years, Machame, Moshi District.

Latin Square X.—Planted 29th December, 1943—Single Stem

Yield in cwt., clean, per acre

Vegetative progeny plots of Tree No.	1946	1947	Mean of 2 years 1946-47
N 110	4·79	12·99	8·89
M 95	4·13	11·16	7·65
KP 532	5·36	16·03	10·70
N 197	9·50	13·70*	11·60
I 235	5·15	12·05	8·60
R 11	5·18	11·14	8·16
Mean	5·69	12·85	9·27

*=Using actual out-turn.

Calculated yields of original parents from which propagating material taken

Tree No.

AB 11 yielded 7·54 cwt., clean, per acre, over 11 years, Meru, Arusha District.
N 50 yielded 15·20 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
L 1 yielded 11·44 cwt., clean, per acre, over 8 years, Kibosho, Moshi District.
KP 263 yielded 9·72 cwt., clean, per acre, over 10 years, C.R.S., Moshi District.
I 47 yielded 11·83 cwt., clean, per acre, over 7 years, Machame, Moshi District.
N 215 yielded 14·08 cwt., clean, per acre, over 7 years, Kilema, Moshi District.

Latin Square XV.—Planted 26th January, 1944—Single Stem

Yield in cwt., clean, per acre

Vegatative progeny plots of Tree No.	1946	1947	Mean of 2 years 1946-1947
AB 11	1·63	12·63	7·13
N 50	0·82	9·82	5·32
L 1	1·17	13·66	7·42
KP 263	1·54	9·62	5·58
I 47	1·23	10·73	5·98
N 215	1·95	9·97	5·96
Mean	1·39	11·07	6·23

Calculated yields of original parents from which propagating material taken

Tree No.

N 198 yielded 11·27 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
R 3 yielded 18·38 cwt., clean, per acre, over 7 years, Machame, Moshi District.
R 25 yielded 8·38 cwt., clean, per acre, over 7 years, Machame, Moshi District.
N 76 yielded 12·63 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
N 220 yielded 13·31 cwt., clean, per acre, over 7 years, Kilema, Moshi District.
N 197 yielded 13·88 cwt., clean, per acre, over 7 years, Kilema, Moshi District.

Latin Square XVI.—Planted 3rd March, 1944—Single Stem

Yield in cwt., clean, per acre

Vegetative progeny plots of Tree No.	1946	1947	Mean of 2 years 1946-1947
N 198	0·72	7·93	4·33
R 3	0·66	7·88	4·27
R 25	0·66	7·04	3·85
N 76	0·83	8·83	4·83
N 220	0·86	4·85	2·86
N 197	1·33	9·29*	5·31
Mean	0·85	7·64	4·24

*=Using actual out-turn.

The Clonal Selection trials have not been running long enough to allow of any definite conclusions to be drawn as to the most suitable clones for this area. With the exception of 3 or 4 all have done remarkably well so far. Liquoring tests of some of the clones were carried out by Mr. Devonshire and the details are given below :—

Raws' order of preference:

N. 39—Very bold, greyish green, greyish-blue. Very good.
N.197—Bold, greyish green, greyish blue. Very good.
N. 81—Very bold, greyish green, ft. greyish blue. Very good.
N. 5—Bold greyish green, ft. greyish blue. Very good.
R. 15—Bold greyish green, ft. greyish blue. Very good.
N.100—Bold greyish green, ft. greyish blue. Very good.
H. 66—Very bold, greyish green. Good.

Roasts order of preference:

N. 5—Bright good hard type, attractive centre cut. Good.
N.100—Bright, hard type generally, few softs. Good.
N. 39—Same as N.100.
R. 15—Fairly bright mixed hard and soft type. Fair to good.
N.197—Same as R.15.
N.81 & H.66 together—Slightly dull softer type. Fair.

Liquors order of preference:

N. 39, N. 5, R. 15 } All well balanced acidity and body. Good.
N.100—Same type as first three but very slightly poorer flavour.
N.197—Good acidity. Rather full body. Good.
N. 81—Fair acidity, full body. Good.
H. 66—Fair acidity, medium full body. Fair to good.

Final Classification

	Class
N 5	2+
N 100	2
N 197	2
N 39	2+
R 15	2
H 66	3
N 81	2−

Details of the crop produced by these clones in 1947 are given below :—

Type of trees	Yield in cwt. clean per acre	Percentages A's	B's	C's	Remainder	Peaberry	Average out-turn clean to cherry	Average weight per bean
		%	%	%	%	%	%	(in gms.)
N 39	13·61	60·7	16·1	5·7	4·6	12·8	17·5	·200
N 81	15·22	66·2	15·1	3·7	5·5	9·6	15·6	·190
N 100	14·30	60·4	22·3	4·3	4·8	8·3	15·1	·181
N 5	12·92	68·1	15·8	3·4	3·5	9·2	16·8	·200
N 197	14·07	69·9	13·4	2·4	1·9	12·4	14·0	·191
R 15	13·13	58·3	24·5	4·0	3·9	9·4	15·6	·177
H 66	20·28	73·5	6·9	1·7	4·0	13·9	15·5	·210

It will be observed that the heaviest yielder (H.66) produced the highest percentage of A's and also the heaviest beans.

MBOSI SUB-STATION

Work at the Mbosi sub-station consisted of planting out of 4 squares of the seedling progeny of selections.

A manurial experiment was laid down on Komera Estate. The object of this is to determine the effect of various phosphatic manures, soil analysis having indicated that the soils in the Mbosi area are generally low in phosphates.

The manurial treatments are :—

Songwe guano, Silicophosphate, Uganda Rock Phosphate, Zizi Rock Phosphate and Niciphos.

ANIMAL HUSBANDRY

The total yield of milk during the year was 5,410 gallons.

There were no instances of "fly" during the year.

The average monthly total head of stock on the station, including calves, was 66 and these were maintained on 30 acres of paddocks and 35 acres of Elephant grass. Supplementary feeding with cotton seed, bran and cake was also given.

The trials of 3 grasses—*Chloris gayana*, *Bromus marginatus* and *Melanis minutiflora* laid down in 1946 were continued. Neither the *Bromus* or the *Melanis* proved as satisfactory as the *Chloris* in withstanding the dry period from September to December.

The herd, which is entirely Zebu, was started with seven foundation cows of unknown breeding. As soon as possible bulls of known breeding were introduced, the first of these, No. 6, was a Baraton introduced from Kenya. The second, No. 7, is a Sahiwal. No. 6 has thrown some very good milkers and No. 3, although of unknown breeding, has left his mark on the herd, one of his daughters, Kaya having given over 400 gallons in one lactation.

Complete data concerning the herd is given in Appendix III. It will be seen that of the original cows only Kenya's progeny have been a failure, the Angwasi progeny are probably the best when considered as a whole.

Thirty-one cows were in milk during 1947. The average yield per cow was 174·5 gallons nd the highest lactation completed in 1947 was 353·7 gallons given by 'Kaya' over 300 days including first four days. 'Rukwa' gave 349·1 gallons from the fifth to three hundreth day inclusive.

Lyamungu,
December, 1948

F. R. Sanders,
Senior Research Officer

STATEMENT OF EXPENDITURE FOR THE PERIOD 1ST JANUARY TO 31ST DECEMBER, 1947

I.—Personal Emoluments

Item No.		Provision Shs. Cts.		Expenditure Shs. Cts.
3.	Chief Scientific Officer	13,742 00	...	13,741 94
27.	Clerks (L.C.S.)	9,750 00	...	6,540 00
29.	Recorders (L.C.S.)	22,000 00	...	7,014 45
31.	Artisans (L.C.S.)	6,700 00	...	6,326 30
32.	Instructors (Ungraded)	3,100 00	...	1,045 00
35.	Laboratory Assistants	2,940 00	...	260 00
36.	Overseers	820 00	...	815 00
38.	Motor Drivers	900 00	...	780 00
39.	Messengers	600 00	...	439 11
		60,552 00	...	36,961 80

II.—Other Charges

41.	Transport and Travelling :			
	Travelling Allowance	1,100 00	...	203 30
	Motor Car Allowance	3,500 00	...	2,730 80
	Hire of Transport	500 00	...	340 04
	Railway Fares and Freight	2,000 00	...	1,192 56
42.	Maintenance and Running of Motor Vehicles	4,100 00	...	3,721 98
43.	Books of Reference	1,400 00	...	611 16
44.	Contingencies	200 00	...	148 53
45.	Office and General	400 00	...	144 91
47.	Uniforms	360 00	...	358 76
48.	Agricultural Development Special Services	1,800 00	...	*2,668 75
57.	Upkeep of and Minor Improvements to Agricultural Stations	4,200	...	2,667 21
59.	Upkeep of Coffee Research Station :			
	(a) Labour		...	46,428 07
	(b) Field Experiments off Station		...	984 03
	(c) Maintenance of Power, Light and Gas		...	3,329 58
	(d) Maintenance of Water Supply		...	375 00
	(e) Upkeep of Coffee Factory	80,000 00	...	2,475 94
	(f) Upkeep of Stock		...	4,889 39
	(g) Equipment and Materials		...	8,958 56
	(h) Trials of Clonal Coffee		...	1,720 94
	(i) Miscellaneous		...	470 00
		99,560 00	...	84,419 51
	Outstanding		...	*4,780 00
	Grand Total ...	99,560 00	...	89,199 51
35.	Subsidization, etc. :			
	2. Cost of Living Relief		...	7,261 90
24.	Miscellaneous Services :			
	33A. Transport and Allowances on Leave		...	190 10
31.	Temporary Clerical Assistant		...	1,277 42
27.	Postages		...	60 05
90	09	... ...	...	20. Passages
32.	Public Works Recurrent :			
	1. Maintenance of and Minor Improvements to Public Buildings	3,000 00	...	2,855 44
	Special Funds—Coffee Board (Coffee Pulper, Store, Garage and Farm Office)	20,000 00	...	11,576 33
D.I.	Conservation and Development of Natural Resources :			
	28. Cowshed, Lyamungu (Capital)	114 00	...	69 81

*Crown Agents' Indents

Monthly Rainfall from September 1937 to end of August 1947.
(in inches)

	September 1937 to end of August 1938	September 1938 to end of August 1939	September 1939 to end of August 1940	September 1940 to end of August 1941	September 1941 to end of August 1942	September 1942 to end of August 1943	September 1943 to end of August 1944	September 1944 to end of August 1945	September 1945 to end of August 1946	September 1946 to end of August 1947
September	1·03	0·17	1·61	0·33	2·76	0·11	0·49	2·42	0·20	7·34
October	4·35	2·16	0·08	1·03	0·09	0·42	0·17	3·15	0·05	4·71
November	3·91	2·57	0·57	0·90	4·47	3·60	2·00	3·10	4·66	1·13
December	1·64	1·02	0·32	1·07	9·72	1·75	0·32	5·14	0·30	2·19
January	0·52	0·22	2·83	1·23	1·59	0·07	1·02	1·72	0·02	2·01
February	2·43	0·41	5·27	1·91	0·38	2·61	1·69	1·39	1·14	0·72
March	12·42	4·57	4·12	2·38	15·02	1·32	5·82	4·85	0·57	3·37
April	10·79	26·18	21·63	15·92	37·07	7·95	30·04	15·19	16·90	28·45
May	19·44	25·31	12·04	10·24	19·43	19·46	11·97	21·34	22·74	25·73
June	2·61	8·74	2·68	5·09	4·54	4·06	4·65	3·45	2·54	10·97
July	1·92	0·77	2·04	0·76	2·38	4·42	2·21	3·15	0·59	1·43
August	0·67	0·54	2·58	2·10	1·22	0·37	1·43	1·33	1·03	1·38
Total (in ins.) ...	61·73	72·66	55·77	42·96	98·67	46·14	61·81	66·23	50·74	89·43

COFFEE RESEARCH STATION HERD RECORD

ORIGINAL COWS	DAUGHTERS	GRAND DAUGHTERS	GRAND GRAND DAUGHTERS	LACTATIONS																						Remarks	
				First		Second		Third		Fourth		Fifth		Sixth		Seventh		Eighth		Ninth		Tenth		Eleventh		No. of Lactations	Period in years
				Days	Gall.	Days	Gall.	Days	Gall.	Days	Gall.	Days	Gall.	Days	Gall.	Days	Gall.	Days	Gall.	Days	Gall.	Days	Gall.	Days	Gall.		
RIFO C				397	136·4	335	321·6	30	16·0	242	205·5	240	209·6	302	182·4	134	166·0									8	9
	VICTORIA (6)	—	—	359	359·5	253	290·6	229	231·9																	2	3
	ALEXANDRIA (6)	—	—	174	60·5																						
MBULU C				212	36·2	195	49·0	236	117·6	27	3·2	191	142·6	186	160·2	152	106·0									8	8
	KAMPALA C			211	144·0	175	100·2	161	108·0	180	130·C	107	87·0	108	109·0	108	92·8									7	7
	ARUSHA C (3)			300	197·1	202	231·0	217	218·0	235	260·0	172	210·0	47	84·5											6	6
		USAGARA (6)		172	119·7																						
	TANGA (5)			126	73·0	136	111·0	144	140·5	166	172·5															4	4
		KILWA (6)		199	171·6	160	139·2																			2	2
	MONDULI C (2)			218	81·8	49	3·2	67	10·0																	3	3
KURUBHAI C						292	114·0	113	26·2	113	123·0	307	246·0	211	129·0	286	305·4	68	29·6							8	8
	BURUMU C (1)			319	153·5	344	267·2	308	145·1	200	172·0	306	271·5	201	156·7	317	315·4	238	137·0	192	320·5	216	223·4			10	10
		KIKAFU C (2)		111	36·2	137	30·7																			2	2
			MOMBASA (5)	253	148·0	211	233·0	224	201·4																		
		NDURUMA (4)		242	161·3	240	311·0	270	321·0	263	336·2	291	230·2													6	6
			RUKWA (X)	300	353·0	294	328·5																			2	2
	WERUWERU (4)			232	135·0	295	354·0	274	336·0	282	232·2															5	6
		MWAYA (6)		318	304·6	321	325·7																			2	2
	NYASA (6)			360	374·5	288	203·0																			2	2
MBULU C								139	25·0	237	71·0	301	64·2														
	RASHARASHA C (X)			249	180·5	290	222·9	225	115·5	201	143·0	77	61·0													5	5
	NGARENANYUKI C (3)			254	180·4	124	105·6	187	132·4	248	206·4	236	198·0	167	147·5											5	5
		CHEYA (6)		175	134·0	228	158·6	218	149·5																	6	6
																										3	2
IMANI C				304	120·5	231	128·5	354	89·2	178	125·0	51	11·4	10	2·6											6	6
	SITIMU (3)			195	48·0	302	306·0	246	165·2	275	315·0	292	295·0													5	6
		DODOMA (6)		358	292·5	202	199·3																			2	2
		MWERA (6)		266	230·2	65	71·3																			2	2
	MAMBA (6)			148	66·9	241	204·2																			2	2
KENYA C						243	27·0	150	54·5	163	18·9															4	4
	RUDISHA C (3)			247	132·7	218	142·7	217	129·0	99	92·6															4	4
		MWANZA C (6)		6	1·5	48	17·7																			2	1
ANGWASI C				249	64·5	298	152·9	173	66·8	239	146·0	278	160·2	17	5.0											7	8
	BULUGA C (X)			232	48·6	203	116·2	325	114·5	192	137·0	216	112·2	254	138·8	255	159·7	55	26·0	277	179·9	143	216·1			10	10
		RUDIANI (3)		199	114·1	261	257·0	242	237·4	230	261·0	235	258·6													5	5
			MAGAMBA C (6)	269	352·0	12	9·8																			2	3
		TABORA C (5)		188	92·0	204	183·0	213	213.0	187	166.2															4	4
		(TRYPS) PEMBA C (6)		71	45·7																						
		MUHEZA (6)		130	78·3																						
	TENGERU (2)			246	136·2	214	158·0	179	128·5	260	220·2	255	205·0	261	211·3	288	229·2									7	7
	KAYA (3)			310	253·7	191	205·0	264	325·3	289	389·4	295	428·0	300	353·7											6	5
		NARUMA (6)		238	253·0	213	261·0	267	301·9																	3	3
	CHUNYA (6)			252	199·3	196	207·8																			2	2

KEY :
Figure following each cow's name indicate sire.
1—Machame bull.
2—Mbulu bull.
3—Congo.
4—Lupa
5—Mbuni.
6—C.R.S.I.
7—Sahibo.
X—Unknown bull.
C—Culled.